

Low-Carbon Retrofit

Creating better places to live



// Sustainable Housing
AWARDS 2011

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“27% of greenhouse gas emissions come from the energy we use to heat, light and power our homes.”

is urgent: the Energy Saving Trust (EST) estimates that 13,400 homes a week require substantial energy refurbishment if we are to meet the emissions targets.

United House's Low-Carbon Retrofit experience encompasses a wide range of solutions that substantially improve the energy performance of every type of home, and we can advise on the most appropriate retrofit solutions for each type of property, from individual houses in conservation areas to multiple occupancy apartment blocks.

The UK has the toughest carbon reduction targets of any country in the world, with the Government committed to reducing greenhouse gas emissions by 34% by 2020, and 80% by 2050.

With 27% of these emissions coming from the energy we use to heat, light and power our homes, it is clear that homes must be far more energy efficient and make better use of alternative energy sources if we are to achieve these targets.

At the same time, 21% of UK households are in fuel poverty, and rising fuel costs mean this figure is likely to increase unless we can reduce household energy consumption.

Adopting a 'low carbon' approach to home improvements will help us meet our carbon reduction targets, and take many vulnerable households out of fuel poverty. But the need

All of our solutions can be carried out with minimum disruption to residents, either as a standalone project or as part of a wider refurbishment programme, such as Decent Homes, and most can be installed without the need to relocate residents to temporary accommodation.

Our experts can also help you to identify which solutions offer the most cost effective way to achieve significant carbon reductions within a limited budget.

Effective Low-Carbon Retrofit benefits residents by reducing fuel bills and providing a more comfortable and healthy living environment. It also future-proofs their homes against climate change, and ensures that property owners have an asset that will retain its value for years to come.



Low-Carbon Retrofit

The Value Carbon approach

The illustration on the right shows the various Low-Carbon Retrofit measures that can be installed to a typical Victorian terrace, or indeed to most homes. Each measure includes a 'Value Carbon' rating.



Value Carbon (VC) is a methodology developed by United House for assessing the relative CO₂ benefit of a retrofit measure against the £ invested. For example an 'Excellent' measure will have a VC score less than £1 per kgCO₂.

Key

- * Fair Value Carbon measure
- **
- *** Good Value Carbon measure
- ****
- ***** Excellent Value Carbon measure

1 Solar thermal and photovoltaic (PV) panels ****

Technology to generate hot water and electricity for use in the home. Hot water is stored within a cylinder and excess electricity generated can be exported to the grid.

2 Mechanical ventilation with heat recovery (MVHR) **

A mechanical ventilation system that removes stale air from the house and feeds fresh, filtered air in via a heat exchanger. Up to 90% of the warmth from the stale air can be recovered before it leaves the building.

3 Low energy lighting *****

Compact fluorescent lamps (CFLs) use only 25% of the energy of standard incandescent bulbs. Modern CFLs can be dimmed and come in a variety of styles.

4 Condensing gas boiler *****

Boilers provide the hot water which is pumped around the home to heat radiators and, if present, a hot water cylinder. Modern boilers operating in a condensing mode (seen by the plume exhaust from the flue) can be up to 92% efficient.

5 Thermostatic radiator valves (TRV) ****

Radiator TRVs are used to control the temperature within a designated room. Energy is saved as unoccupied rooms and bedrooms can be set to lower temperatures than the general living space.

6 Low flow shower heads ***

Taking showers instead of baths can save up to 40% of water use in the home. If the shower head includes a low flow type head, up to 20% energy saving can also be achieved due to the reduced demand for hot water.

6a Low volume bath **

6b Low flow taps **

6c Dual flush WC **

7 'A' rated windows ***

One-quarter of the heat loss energy from the home can be via the windows due to poor insulation performance and draughts. Installing 'A' rated windows can save 20% on energy bills.

8 Internal wall insulation (IWI) *****

Many older properties have a solid wall construction and cannot be insulated with cavity fill or externally due to planning constraints. Up to 40% of the heat loss from solid wall properties can be through the walls. IWI involves fitting an insulation material to the inside face of the external walls. This measure can save up to £445 per year on heating bills.

9 Floor insulation *

Ground floors that are either suspended or solid can be insulated to reduce heat loss. In many cases insulating floors also reduces cold air draughts as the gaps between floor boards will be sealed.

10 Smart metering ***

Smart meters put residents back in control of their own energy bills. They show how much energy is being used by appliances in the house in pounds and pence.

11 Rainwater harvesting or water butt **

Rainwater can be collected for use in the garden and/or in the home to flush toilets. With a suitably sized collection tank up to 20% saving can be achieved on water bills.

12 Roof insulation *****

It is well known that heat rises. Therefore having a well insulated loft or roof is top priority. 250mm of insulation can be easily installed saving on average £80 per year on the heating bill.

13 Front and back doors ***

High performance insulated or double glazed doors can be installed to improve U-values to reduce heat loss and draughts.



Fabric insulation

“Fitting internal wall insulation using WHISCERS™ can save £445* a year in fuel bills by reducing heat loss through the walls without disrupting residents.”

However, this is not suitable for many properties including the seven million older, solid walled homes in the UK, two million of which are in London. Reducing heat loss in these homes is notoriously difficult, as planning restrictions often mean that external cladding is not acceptable, and internal wall insulation can be disruptive, with residents having to move out for up to 10 days while the work is done.

However, United House has developed a patented internal wall insulation system that minimises disruption for residents and allows them to stay in their home during the retrofit.

The award-winning WHISCERS™** process uses laser scanning to measure the internal dimensions of a room, with the measurements downloaded to a factory-based off-site machine that cuts insulation boards to match the walls perfectly. The boards are then delivered to site as a kit and fitted with the minimum of noise, mess and disruption, with a typical room taking just one hour to complete.

In a typical home up to 40% of all heat loss is through the walls, so this is an important starting point for reducing overall energy consumption and carbon emissions.

Both external and cavity wall insulation are very effective methods of improving energy performance and reducing heat loss with minimum disruption to residents. Correctly installed cavity wall insulation can save around 560kg of CO₂ a year, and pay for itself in reduced energy bills within two years.

Using WHISCERS™ eliminates relocation costs, and is more cost effective than external wall insulation.

Other simple fabric insulation improvements include roof insulation, top-up or replacement loft insulation, and floor insulation such as the Eco-Slab system.

*Source: Energy Saving Trust. **WHISCERS™ won the Innovation Award at the 2011 Sustainable Housing Awards. WHISCERS™ is protected by European patent and United House is the sole UK licensee.



Fabric insulation case studies

Aubert Park, Islington

Client: London Borough of Islington
 Property type: Ground floor flat in Victorian terrace
 Wall type: Solid brick
 Retrofit: Wall insulation, floor insulation, draught proofing

Bertram Street

Client: London Borough of Camden
 Property type: Three-storey Victorian terraced house
 Wall type: Solid brick
 Retrofit: Internal wall insulation using WHISCERS™ process

Royal Free Hospital, Hampstead

Client: Newlon Housing Trust
 Property type: 141 units in 13-storey 1960s tower block
 Wall type: Concrete cladding panels
 Retrofit: External insulation render

Four Courts Estate, St Leonards-on-Sea

Client: AmicusHorizon
 Property type: 400 flats in four 17-storey 1960s tower blocks
 Wall type: Concrete panels
 Retrofit: External insulated over-cladding



Glazing

“An ‘A’-rated double glazing system cuts heat lost through windows by half.”

If energy saving and carbon reduction are particularly important, and the budget is available, a client can achieve even lower U-values by specifying triple glazing.

For older properties, and where building heritage is of particular importance, vacuum glazing achieves very low U-values without adversely affecting the appearance of the property. It consists of two panes of glass separated by a vacuum of just 0.2mm, giving an overall glazing thickness not much greater than single glazing, but with a U-value of 1.6 – better than 20mm low-e, argon-filled double glazing – making it ideal for retrofitting historic buildings.

Most homes built during the last 30 years were fitted with double glazing as standard. However, older systems are inefficient at cutting heat loss in comparison with today’s glazing – many would only receive a rating of ‘G’ on the energy efficiency scale.

United House has experience of all low carbon glazing solutions, and can advise on the most appropriate solution for any given specification. We have expertise in different types of glazing construction, but recommend environmentally sensitive glazing, manufactured from slow growing sustainable pine and faced with aluminium to minimise future maintenance.

As a result, it can be cost effective to retrofit modern double glazing, not just as a replacement for old, single glazed windows, but also in buildings that have poor performing double glazing systems. An ‘A’-rated double glazing system cuts heat lost through windows by half, and can save around 680kg of CO₂ a year in a typical house.

All the timber we use in our glazing solutions is certified by the Forest Stewardship Council (FSC) as being from sustainable sources.

Glazing case studies

Lothrop Street, Queens Park

Client: CityWest Homes
 Property type: Two-storey Victorian terraced house
 Window type: Single glazing
 Retrofit: Vacuum double glazing

Churchmead Close, Barnet

Client: Barnet Homes
 Property type: 19 two-storey 1950s terraced flats
 Window type: Single glazing
 Retrofit: A-rated uPVC double glazing

Colne & Mersea Houses, Harts Lane Estate, Barking

Client: London Borough of Barking & Dagenham
 Property type: 200 flats in two 17-storey 1960s tower blocks
 Window type: uPVC double-glazing
 Retrofit: Triple-glazed timber frames with aluminium exteriors

Chalcots Estate, Camden

Client: London Borough of Camden
 Property type: Five 23-storey tower blocks
 Window type: Single-glazing, aluminium framed
 Retrofit: A-rated uPVC self cleaning double glazing



Heating and energy efficiency

“Upgrading from a ‘G’-rated to an ‘A’-rated boiler can cut carbon emissions by 1.1t a year.”

heat and power (CHP), and are exploring the viability of fuel cell micro CHP.

In most homes carbon, energy and fuel bills can be reduced simply by installing voltage power optimisation equipment, which takes out the discrepancy between the supply voltage going into the building and the optimum voltage that most electrical equipment needs.

Fitting homes with Smart meters also cuts energy and carbon use by making residents more aware of their energy consumption. All homes are due to have Smart meters fitted by 2020, but United House has already installed these in hundreds of properties.

We have also trialled the Wattbox, a smart control unit that learns householders’ energy habits, which could deliver home energy savings of up to 20% without compromising comfort.

Many retrofit solutions can make a significant contribution to energy and carbon reduction at relatively low cost. For example, in an average household, 60% of energy costs go on generating heating and hot water through a boiler, so an energy efficient boiler can make a big difference to energy consumption.

Upgrading from a ‘G’-rated to an ‘A’-rated boiler can reduce fuel bills by £225 a year and cut carbon emissions by 1.1t.

United House has been installing new boilers since the 1960s, and has installed thousands of new heating systems under the Decent Homes programme, fitting ‘A’-rated condensing boilers as standard. We also have experience of more advanced systems, including micro combined

Mechanical Ventilation Heat Recovery (MVHR) units can be retrofitted to well sealed, modern homes to provide a low carbon, occupant-friendly ventilation solution.

There are some simple Low-Carbon Retrofit options that yield significant savings at very little cost, including effective draught-proofing and low energy LED lighting, which are simple and cost effective to fit in any type of building.

Heating and energy efficiency case studies

Aubert Park, Islington

Client: London Borough of Islington
 Property type: Ground floor flat in Victorian terrace
 Retrofit: Micro CHP, MVHR, low flow shower/low volume bath, rainwater harvesting, low energy lighting

Sterndale Road, Hammersmith

Client: Notting Hill Housing Trust
 Property type: Four-storey house in Victorian terrace
 Retrofit: Voltage regulation, low flow shower/low volume bath, rainwater harvesting, low energy lighting

Colne & Mersea Houses, Harts Lane Estate, Barking

Client: London Borough of Barking & Dagenham
 Property type: 200 flats in two 17-storey 1960s tower blocks
 Retrofit: Smart meters, low flow showers/low volume bath, low energy lighting

Queens Park Estate, Westminster

Client: Dolphin Square Foundation
 Property type: Seven Victorian terraced houses
 Retrofit: MVHR, condensing eco boiler, eco-kitchen with triple A-rated appliances, low flow shower/low volume bath, low energy lighting



Renewables

“A PV system can generate 50% of a home’s electricity needs.”

planning process and advise on the products and financial incentives available.

One such incentive, the Government’s Renewable Heat Incentive (RHI) scheme, gives cash back to individuals, business and communities for renewable heat generation, and is applicable to solar thermal hot water systems, air and ground source heat pumps and biomass boilers.

Solar hot water panels are relatively straightforward to install, but require specific conditions for optimum effectiveness, and are not suitable for all buildings. We can advise clients on the most appropriate solar hot water systems for different properties and on the benefits they can expect.

We are also preparing for an upsurge in demand for ground and air source heat pumps, which extract low grade heat from the environment, and can be used to reduce heating bills in the winter and cool the air in the summer.

We also have expertise in micro-wind generation and biomass boilers, which are particularly appropriate for rural properties that are not connected to mains gas power supply. A biomass boiler can save £600 a year compared to electric heating.

The UK Government is committed to increasing the proportion of energy generated by renewable sources and also wants the amount of domestic heat generated by renewables to rise from 1% to 12%.

United House is a Microgeneration Certification Scheme (MCS) certified installer with expertise in the technologies that will help meet these challenging targets, including photovoltaic (PV) arrays, solar thermal hot water and air source heat pumps.

PV systems can save 1.2t of CO₂ a year per household, and generate 50% of a home’s electricity needs. They can be fitted on a diverse range of buildings, and do not usually require planning permission. Where it is needed – for example in conservation areas – United House can help clients through the

Renewables case studies

Sterndale Road, Hammersmith

Client: Notting Hill Housing Trust
Property type: Four-storey Victorian terraced house
Retrofit: Solar thermal, photovoltaics

Bertram Street, Camden

Client: London Borough of Camden
Property type: Three-storey Victorian terraced house
Retrofit: Solar thermal, photovoltaics

Colne & Mersea Houses, Harts Lane Estate, Barking

Client: London Borough of Barking & Dagenham
Property type: 200 flats in two 17-storey 1960s tower blocks
Retrofit: Photovoltaics (providing 56kWp)

Queens Park Estate, Westminster

Client: Dolphin Square Foundation
Property type: Seven Victorian terraced houses
Retrofit: Photovoltaics installed in five of the seven properties



Working with United House

“Installing eco measures is only half the battle: resident behavioural change is fundamental to making the investment worthwhile.”

We understand the different funding options that make low carbon energy solutions cost effective, and can help evaluate the priority order in which clients should invest in low carbon measures.



Through our **Value Carbon** process, we are able to identify the most cost effective Low-Carbon Retrofit solutions

for each property. For example, for one client it may be preferable to invest in simple measures such as insulation, lighting and heating, while another could make use of the Feed-In Tariff or Renewable Heat Incentive to invest in PV, solar thermal or air source heat pumps.

United House makes the process of going low carbon easier, with experts who can help at all stages of the retrofitting process, from identifying funding, through planning and design, to installation and handover.

Our resident liaison team is trained to minimise the disruption to residents, and many of our larger programmes are undertaken with residents remaining in their homes throughout the works.

Converting the Government’s carbon reduction targets into action and interpreting legislation can be challenging for housing providers. However, as a pioneer in Low-Carbon Retrofit, United House is well placed to advise on the implications of the current legislation and standards.

Installing eco measures to a home is only half the battle, and we recognise that resident education goes hand in hand with energy efficiency improvements. Behavioural change is fundamental to making retrofit investments worthwhile.

We already work with major clients on the Government’s Carbon Emission Reduction Target (CERT) and Community Energy Saving Programme (CESP), and are geared up for the Energy Company Obligation (ECO) and the Green Deal.

This is a vital element of our Low-Carbon Retrofit offer, and we have developed expertise in working with residents before, during and after retrofit projects to prepare them for low energy lifestyles, so that they are ready to maximise the benefits once the works are complete.



Some of our experience at-a-glance

Our experience encompasses a wide range of solutions that have substantially improved the energy performance of every type of home. We can advise on the most appropriate retrofit solutions for each type of property, from individual houses in conservation areas to multiple occupancy flats in tower blocks.

		LOW CARBON MEASURES INSTALLED				THE RESULTS		
Project/Client	Property type	Fabric insulation	Glazing	Energy efficiency	Renewables	Carbon saving	Annual fuel bill saving	
OLDER PROPERTIES	Aubert Park, Islington London Borough of Islington	Ground floor flat in Victorian terrace	Aerogel internal wall insulation, insulation to floors, draught proofing	Vacuum double glazed sash windows with 0.2mm gap. Double glazed back door	Micro CHP boiler, MVHR, low flow shower/low volume bath, rainwater harvesting, low energy lighting	70%	£465	
	Sterndale Road, Hammersmith Notting Hill Housing Trust	Four-storey Victorian terraced house	Internal wall insulation, draught proofing, aerated ball clay insulated hardcore, insulating quilt to intermediate floors	High performance vacuum glazing	Voltage regulation to reduce energy used by appliances, low flow shower/low volume bath, rainwater harvesting, low energy lighting	84%	£1,742	
	Project Issy-Clad, Islington London Borough of Islington	34 Victorian solid walled houses	Eco-liner board internal wall insulation installed on battens				Not calculated	Not calculated
	Bertram Street, Camden London Borough of Camden	Three-storey Victorian terraced house	Polyfoam EPS internal wall insulation using WHISCERS™ process	Vacuum double glazed sash windows, front and back doors	MVHR, low flow shower/low volume bath, low energy lighting	8m2 Solar thermal and 8m2 photovoltaics (1.1kWp)	77%	£600 (64% reduction)
	Queens Park Estate, Westminster Dolphin Square Foundation	Seven Victorian terraced houses	Celotex PIR internal wall insulation, acoustic insulation to party walls, 'Eco-Slab' dense EPS floor, Eco roll loft insulation	Traditional sash double glazed timber windows, Doors fitted with vacuum double glazing and NanoPore vacuum thermal insulated panels	MVHR, ecoTEC boiler, eco-kitchen and triple A-rated appliances, low flow shower/low volume bath, low energy lighting, Wattbox installed in two homes	Photovoltaics (1.44kWp) installed to 5 of the 7 homes	75% in properties with PVs	£443 - 579
	Lothrop Street, Queens Park CityWest Homes	Two-storey Victorian terraced house	Aerogel thermal dry lining, 'Eco-Slab' dense EPS floor, Warmcel cellulose loft insulation	Vacuum double glazing. Doors fitted with NanoPore vacuum thermal insulated panels	WattBox intelligent heating controller, micro CHP boiler, MVHR, low energy lighting, triple A-rated appliances		80%	Not calculated
TOWER BLOCKS	Chalcots Estate, Camden Partners for Improvement in Camden	Five 23-storey 1960s tower blocks	External over-cladding, roof replacement	A-rated uPVC self cleaning double glazing	Grade A boilers	30%	Not calculated	
	Colne & Mersea Houses, Harts Lane Estate, Barking London Borough of Barking & Dagenham	200 flats in two 17-storey 1960s tower blocks	External insulation render, insulated roof	Triple-glazed timber with aluminium exteriors	Smart meters, low flow showers/low volume bath, low energy lighting, central gas boiler plant	Photovoltaics (261 panels providing 56kWp)	72%	£400 per home
	Four Courts Estate, St Leonards-on-Sea AmicusHorizon	400 flats in four 17-storey 1960s tower blocks	External insulated over-cladding		Renewal of entire above ground soil and waste system		Not calculated	Not calculated
	Royal Free Hospital, Hampstead (keyworker accommodation) Newlon Housing Trust	141 units in 13-storey 1960s tower block	External insulated render	Double glazing	Green roof		Not calculated	Not calculated
	Linden Lee & Wenlock Edge Mole Valley Housing Association	104 flats in two 13-storey 1960s tower blocks	Phenolic internal wall insulation		Condensing boiler		Not calculated	Not calculated
1930s/1950s	Churchmead Close, Barnet Barnet Homes	19 flats in 1950s terrace	Cavity wall and roof insulation	A-rated uPVC double glazing	Low energy lighting, condensing boilers, low energy fans	1.5t per year	£240	
	Burnside Road, Barking London Borough of Barking & Dagenham	Four 2-bed inter-war period houses	External insulation render and insulation to all roof spaces	Triple glazing	A-rated high efficiency condensing boiler, low energy lighting, low flow shower/bath, draught proofing, Smart meters	Photovoltaics	72%	£500



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Our thanks go to the Symons and Harris families for their help with photography.
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Paper from responsible resources. FCS chain of custody certificate number SA-COC-001685

